



MODEL FPM-200

FIXED-PORTABLE-MOBILE TRANSMITTER/EXCITER

Complete, Compact, Self-Contained Station

200 Watts Input 80 Thru 10 Meters

the hallicrafters co.

4401 W. FIFTH AVENUE • CHICAGO 24, ILLINOIS

SECTION II TECHNICAL DATA

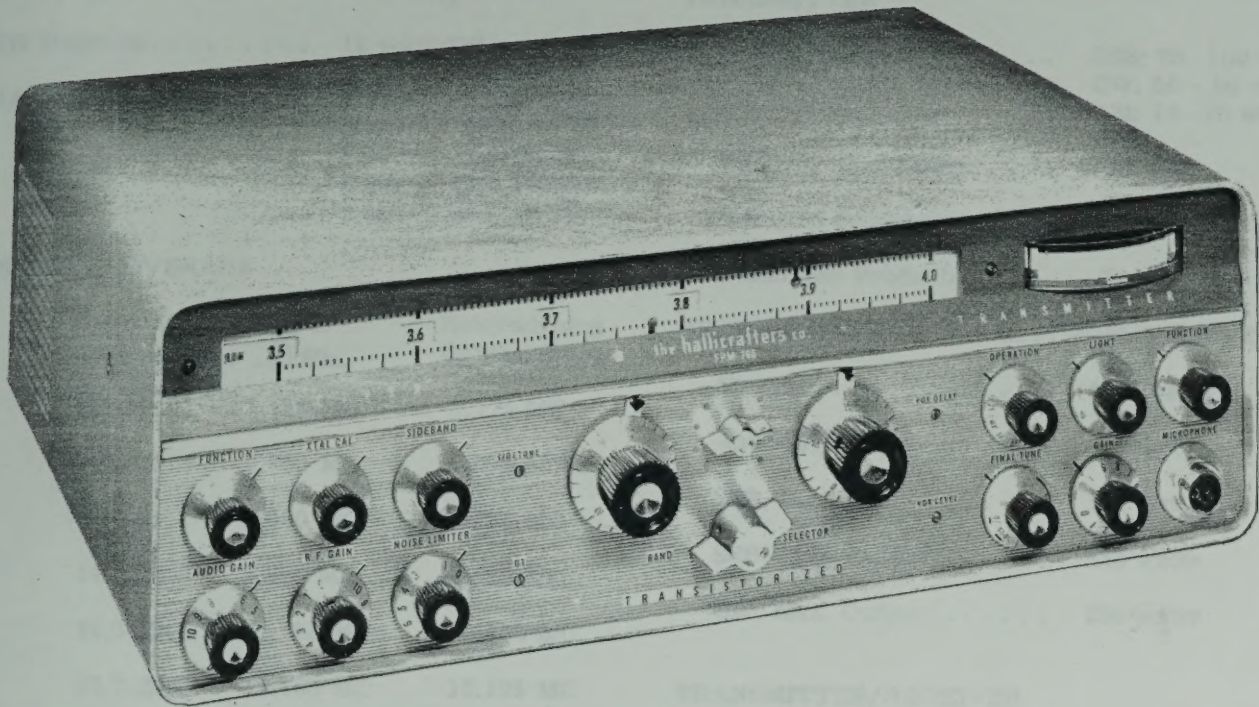


Figure 1. Hallicrafters Model FPM-200 Transmitter Receiver

SECTION I GENERAL

The Hallicrafters Model FPM-200 Transmitter-Receiver/Transceiver is of the hybrid type using a combination of 39 transistors, 3 vacuum tubes and 2 gas tubes. The power supply, the receiver circuits, and the low level transmitter stages are completely transistorized. The high power stages of the transmitter use 3 vacuum tubes to develop the required power for transmitting and two gas tubes to regulate the screen voltage for the final amplifier stage. The Transceiver provides for AM (amplitude modulated), CW (continuous wave) and SSB (single-sideband) reception and transmission on the 80, 40, 20, 15, and 10 meter bands. An additional range is provided in the receiver for the reception of station WWV (10 MC). Each tuning range is 500 KC, readable directly in kilocycles.

Two tunable oscillators (VFO's) are provided with selection to permit this unit to operate as an

independent transmitter and receiver on different frequencies within a given band, or to operate as a transceiver on one frequency--both functions being controlled by one oscillator.

A built in 100-KC crystal oscillator permits a front panel adjustment for calibration of the VFO kilocycle dial.

Other features of this unit include an "S" meter which indicates receiver signal strength as well as transmitter RF output level...modular construction (glass epoxy circuit boards)...upper and lower crystal lattice filters (2.325 MC) for transmitting and receiving...adjustable noise limiter...fast AGC for SSB operation...single control transmitter tune up...blower for air circulation around tubes and internal power supply...and keyed tone through SSB system for CW transmission.

SECTION II

TECHNICAL DATA

MODES OF OPERATION AM, SSB, and CW

POWER SOURCE 12 volts DC

AUXILIARY EQUIPMENT . . . Auxiliary Power Supply (115 VAC to 12 VDC), Microphone (dynamic type recommended) and CW key

FREQUENCY COVERAGE

<u>Band</u>	<u>Calibrated Range in MC</u>	<u>Step IF Freq.</u>	<u>Heterodyning Crystal Freq.</u>
WWV	9.7-10.2	1.450 MC	3.775 MC
80	3.5-4.0	4.750 MC	7.075 MC
40	6.8-7.3	1.450 MC	3.775 MC
20	14.0-14.5	5.750 MC	3.425 MC
15	21.0-21.5	12.750 MC	10.425 MC
10	27.7-28.2	19.450 MC	17.125 MC
10	28.2-28.7	10.950 MC	17.625 MC
10	28.7-29.2	20.450 MC	18.125 MC
10	29.2-29.7	20.950 MC	18.625 MC

Filter and IF Frequency: 2.325 MC

VFO Range: 8.250 - 8.750 MC

RECEIVER

Sensitivity	Better than 3 microvolts for a 10 DB signal-to-noise ratio
Selectivity	2.5 KC at 6 DB 6 KC at 60 DB
Audio Power Output	5 watts
Output Impedance	3.2 and 500 ohm
Power Consumption	No signal: 40.8 watts Maximum output: 54 watts

TRANSMITTER

Output Power	SSB: 70 - 100 watts CW: 60 - 90 watts AM: 15 - 20 watts
Carrier Suppression	-50 DB
Sideband Suppression	-50 DB
Distortion Products	-30 DB

TRANSMITTER/RECEIVER POWER CONSUMPTION

Standby	40.8 watts
AM 100% Modulation	216 watts
SSB, No Signal	132 watts
SSB, Max. Output	216 watts
CW, Max. Output	288 watts

TRANSMITTER/RECEIVER

Dimensions	16" wide, 5" high, 11" deep
Weight	24.5 pounds
Shipping Weight	26 pounds

MOUNTING RACK

Dimensions	5.75" high, 2.5" deep, 14" wide
Weight	6 pounds
Shipping Weight	7 pounds

AUXILIARY POWER SUPPLY

Dimensions	7" wide, 5" high, 11" deep
Weight	27.5 pounds
Shipping Weight	29 pounds

SECTION III

INSTALLATION

3-1. UNPACKING

Carefully remove the FPM-200 Transmitter/Receiver from the carton and packing material and examine it closely for any possible damage which may have occurred during transit. Should any sign of damage be

apparent, file a claim immediately with the carrier stating the extent of damage. Carefully check all shipping labels and tags for any special instructions before removing or destroying them.

3-2. LOCATION

The Transmitter/Receiver may be placed in any location that permits free air circulation through the ventilation openings on each side of the unit. However, excessively warm locations such as those near radiators or heating units should be avoided. The external speaker may be located in any convenient place. When the auxiliary power supply is used (base installations) place it against the left side of the Transmitter/Receiver thus allowing ventilation of both units by the fan in the Transmitter/Receiver.

3-3. ANTENNAS

In mobile installations a coaxial antenna connector is provided on the rear of the mounting rack for connection of the antenna.

In the base installation using the auxiliary supply, two coaxial connectors are provided from the power supply power cable. The XMIT connector can be used for both receiving and transmitting when the FPM-200 is used as an independent receiving and transmitting unit. If a linear amplifier is used the XMIT connector is connected to the linear amplifier input and the REC connector is connected to the external antenna change-over relay (see figure 2). If desired, two separate antennas may be used to eliminate the external change-over relay.

Refer to the ARRL handbook or similar publications for the selection and installation of antennas.

3-4. MOBILE INSTALLATION

The FPM-200 Transmitter/Receiver may be installed in any vehicle having a 12 volt DC power supply with the negative side grounded. A base bracket and

straps are provided for installing the mounting rack (see figure 3). When selecting the installation location of the rack, an open area should be allowed on either side with the rack sides extended for ventilation when the Transmitter/Receiver is in place.

The microphone is connected to the front of the Transmitter/Receiver; all other connections are made through the power socket to the mounting rack. The mounting rack provides two phone jacks, a coaxial connector, an 11-pin socket and a terminal board for external connections. KEY and SPKR jacks are provided on the right side of the mounting rack for connection of a CW key and a 3.2 ohm speaker, headphones may also be connected to the SPKR jack. A 500 ohm speaker may be connected to pins 3 and 2 (gnd.) of the 11-pin socket. Provision is also made to connect the CW key to pins 6 and 4 (gnd.) of the 11-pin socket. The 12 volt DC power should be connected directly from the battery to the mounting rack terminal board with a No. 10 or 12 AWG shielded power cable. Connect the shielded conductor to the positive (+) battery terminal and the positive terminal (black wire) of the terminal board. Connect the cable shielding to the negative (-) battery terminal and the negative terminal (yellow wire) of the terminal board. These connections may be made before the mounting rack is mounted in the vehicle.

CAUTION

DO NOT CONNECT THIS EQUIPMENT IN A VEHICLE WHICH HAS A POSITIVE GROUND ELECTRICAL SYSTEM.

After the mounting rack has been installed and electrical connections made, the Transmitter/Receiver can be put into place (see figure 3). Secure the rack sides to the unit sides with the clamps provided.

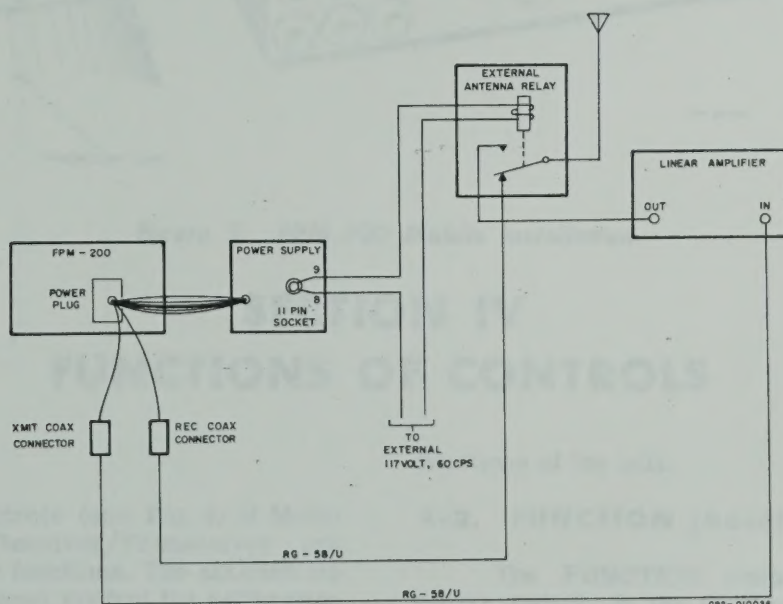


Figure 2. FPM-200 Driving A Linear Amplifier

3-5. MOBILE NOISE SUPPRESSION

The following suggestions may be helpful in the suppression of noise encountered in mobile operation. Install resistor type spark plugs and coaxial bypass capacitors at ignition coil, generator, and voltage regulator leads. Install bracket mounted coaxial capacitors in generator and battery leads to the voltage regulator and a 0.005 mfd. mica or ceramic disk from the generator lead to ground. Chokes may be used in the generator field and armature leads instead of the bypass capacitors. Approximately 12 turns of No. 18 wire on a 1/4" powdered iron core for the field lead choke and approximately 12 turns of No. 14 or 12 wire on a 1/4" powdered iron core for the armature lead choke.

Additional information for the suppression of mo-

bile noise is available in current handbooks.

3-6. BASE INSTALLATION

The FPM-200 Transmitter/Receiver, as a base station, may be operated with or without a linear amplifier. To operate from 117 volts AC, the Auxiliary Power Supply, P-200 is required. The power supply provides 12 volts DC, a speaker, a KEY jack, a SPKR jack and an 11-pin socket for external connections. As in the case of mobile installation a 500 ohm speaker and a CW key may be connected to pins 3 and 2 (gnd.) and pins 6 and 4 (gnd.) respectively of the 11-pin socket. When a linear amplifier and a changeover relay are used, pins 8 and 9 provide the control circuit for the relay. Refer to figure 2 for connection of the FPM-200 with a linear amplifier, antenna changeover relay, and antenna.

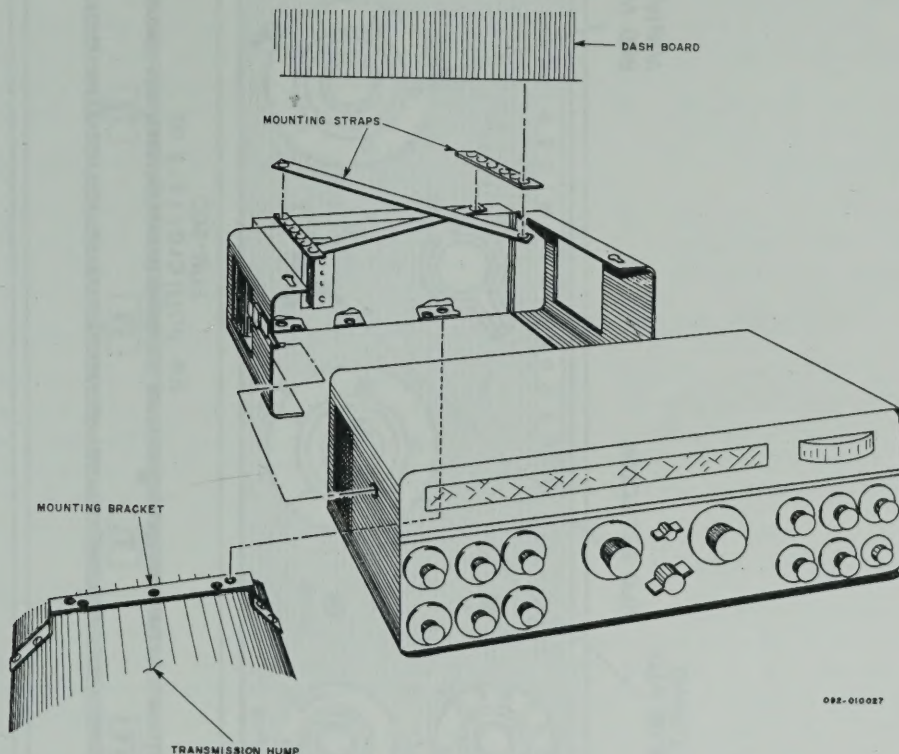


Figure 3. FPM-200 Mobile Installation

SECTION IV FUNCTIONS OF CONTROLS

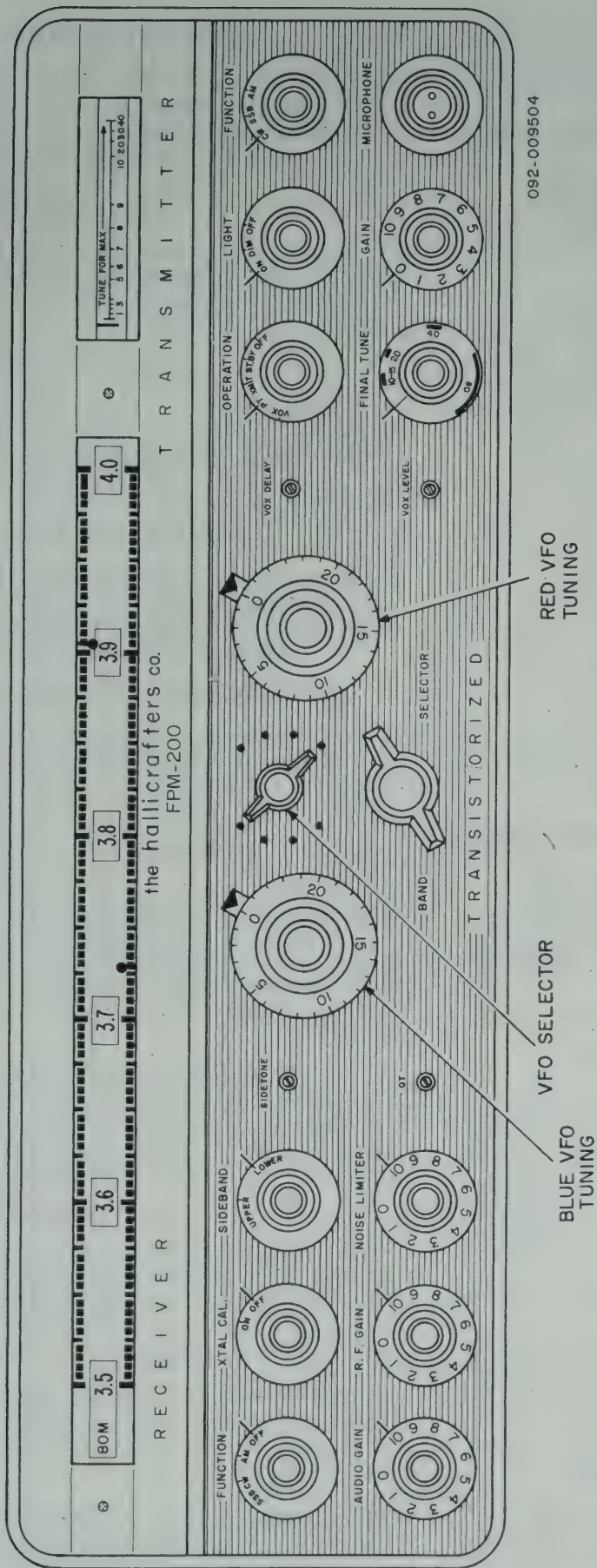
4-1. GENERAL

The front panel controls (see Fig. 4) of Model FPM-200 Transmitter-Receiver/Transceiver are grouped according to their functions. The six controls on the left of the front panel control the calibration and receiving functions. The five controls on the right side of the front panel and the four screwdriver adjustments control the transmitting function. The four controls in the center of the front panel select and tune the VFO's for both the transmit and receive

functions of the unit.

4-2. FUNCTION (Receiver)

The FUNCTION control is a three-position rotary switch. In the OFF position all power is disconnected from the circuitry. In either the AM or SSB/CW positions power is applied to the receiver section of the equipment. In the AM position AM signals can be received; in SSB/CW position SSB and CW signals can be received.



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Figure 4. FPM-200 Operating Controls

4-3. AUDIO GAIN (Receiver)

The AUDIO GAIN control is a potentiometer in the audio amplifier circuit. Clockwise rotation of this control will increase audio output while counterclockwise rotation will decrease audio output.

4-4. RF GAIN (Receiver)

The RF GAIN control is a potentiometer in the AGC amplifier circuit. Clockwise rotation increases the RF gain of the receiver and counterclockwise rotation decreases the RF gain of the receiver.

4-5. SIDEBAND (Common)

The SIDEBAND control is a two-position rotary switch. With this control the operator may select either the UPPER or LOWER sideband for receiving or transmitting SSB/CW signals.

4-6. NOISE LIMITER (Receiver)

The NOISE LIMITER control is a potentiometer in the noise limiter circuit. Counterclockwise rotation decreases the noise limiting effect, and clockwise rotation increases the noise limiting effect.

4-7. CRYSTAL CALIBRATOR (Receiver)

The XTAL CAL control is a two-position rotary switch. In the ON position this switch activates the 100-KC crystal marker, thus providing a known frequency to be used in calibration of the VFO's.

4-8. OPERATION (Transmitter)

The OPERATION control is a five-position rotary switch. This switch is used to select the operating condition of the transmitter portion of the unit. It should be noted that the FUNCTION (receiver) switch on the left of the front panel must be in the AM or SSB/CW position to apply power to the transmitter portion.

4-9. FINAL TUNE (Transmitter)

The FINAL TUNE control consists of two continuously tunable capacitors. These capacitors tune the final output and driver stages of the transmitter to the operating frequency.

4-10. GAIN (Transmitter)

The GAIN control is a potentiometer in the microphone amplifier circuit. This control sets the level of the signal to be transmitted. It also sets the output level in CW operation.

4-11. FUNCTION (Transmitter)

The FUNCTION control is a three-position rotary switch. This control is used to select the transmitter mode of operation.

4-12. LIGHT

The LIGHT control is a three-position rotary switch for controlling the brightness of the illuminating lamps.

4-13. BAND SELECTOR (Common)

The BAND SELECTOR control is a nine-position rotary switch used to select the desired band for receiving and transmitting. This control is mechanically connected to a cylindrical indicator located

behind the dial scale and indicates the band in meters and the frequency in megacycles through windows in the dial scale.

4-14. VFO SELECTOR (Common)

The VFO (variable frequency oscillator) selector is a four-position switch used to select a receiving VFO and a transmitting VFO. The unit has two VFO's identified with the colors blue and red.

The indicators (red and blue dots) on the left of the VFO selector control indicate the VFO used to receive. The indicators on the right of the VFO selector control indicate the VFO used to transmit. Four possibilities exist, starting counterclockwise:

1. Position 1. - Control set to a blue dot on the left and a red dot on the right--blue VFO receiving, red VFO transmitting.
2. Position 2. - Control set to a blue dot on each side--blue VFO receiving and transmitting (transceiver operation).
3. Position 3. - Control set to a red dot on the left and a blue dot on the right--red VFO receiving, blue VFO transmitting.
4. Position 4. - Control set to a red dot on each side--red VFO receiving and transmitting (transceiver operation).

4-15. VFO TUNING

There are two VFO tuning controls, one for each VFO. Each control has its own indicator on the dial scale. The control on the left controls the blue VFO and bottom indicator. The control on the right controls the red VFO and top indicator.

4-16. SIDETONE (Screwdriver Adjustment)

The SIDETONE control is a potentiometer which is switched into the system by the transmitter FUNCTION control in the CW position. When switched into the circuit it controls the level of a signal from the microphone amplifier stage to the audio amplifier stage of the receiver. The front panel meter provides an indication of the audio signal level being transmitted.

4-17. QT (Screwdriver Adjustment)

The QT (anti-trip) control is a potentiometer in the QT amplifier circuit. This control determines the audio level of a signal which may be received without turning the transmitter on when using VOX.

4-18. VOX DELAY (Screwdriver Adjustment)

The VOX DELAY control is a potentiometer which controls the time the VOX relay remains operated after a transmitted signal has been completed.

4-19. VOX LEVEL (Screwdriver Adjustment)

The VOX LEVEL control is a potentiometer which controls the signal level required to operate the VOX relay.

SECTION V

TUNING PROCEDURE

5-1. GENERAL

The tuning procedure for the Model FPM-200 is not complicated, however, care should be exercised when tuning to insure maximum performance of the equipment. Be sure that the power cord plug is securely inserted into the socket on the rear of the chassis. It is suggested that each time the unit is put into operation, the settings on the VFO controls be checked with the crystal marker. This operation will be covered in paragraph 4-2.

5-2. CALIBRATION OF VFO's

The calibration of the VFO's should be made with the BAND SELECTOR control set to the desired band of operation. Disconnect the antenna to eliminate the possibility of tuning the VFO's to an incoming signal.

The following is a step-by-step procedure for the calibration of the VFO's:

1. Set the indicated controls as shown below:

FUNCTION (receiver)	SSB/CW
XTAL CAL	ON
SIDE BAND	Either UPPER or LOWER
AUDIO GAIN	5
RF GAIN	10
NOISE LIMITED	0
OPERATION (transmitter)	OFF
BAND SELECTOR	To desired band
VFO SELECTOR	2nd position (blue/blue)

2. Rotate the blue (left-hand) VFO control until the blue dial indicator is set to a multiple of 100 KC; rock the control back and forth to obtain a zero-beat. Move the black pointer located above the control to the O on the control skirt. The skirt provides a fine tuning indicator for the blue VFO; each division is 1 KC.
3. Set the VFO SELECTOR to the 4th position (red/red).
4. Rotate the red (right-hand) VFO control until the red dial indicator is set to a multiple of 100 KC; rock the control back and forth to obtain a zero-beat. Move the black pointer located above the control to the O on the control skirt. The skirt provides a fine tuning indicator for the red VFO; each division is 1 KC.

5. Both VFO's have now been calibrated for receiving and transmitting on the band indicated on the tuning dial. Turn the XTAL CAL control to the OFF position and connect the antenna.

5-3. RECEIVING

The receiver section of the transceiver will operate with the transmitter section turned off (OPERATION control OFF). The following is the procedure for tuning in a signal.

1. Set the indicated controls as shown below:

FUNCTION (receiver) . .	AM for AM reception, SSB/CW for SSB or CW reception.
XTAL CAL	OFF
SIDE BAND	Desired side-band for SSB or CW reception, either position for AM reception.
AUDIO GAIN	5
RF GAIN	10
NOISE LIMITER	0
OPERATION (transmitter)	OFF
BAND SELECTOR	Desired band
VFO SELECTOR	Desired VFO combination

2. Tune to the desired frequency by rotating the VFO control corresponding to the VFO selected for receiving.
3. Adjust the volume to a comfortable listening level with the AUDIO GAIN control (clockwise rotation increases the volume and counterclockwise rotation decreases the volume).
4. The RF gain control is normally set for maximum gain (10). However, when receiving extremely strong CW or SSB signals, reducing the RF gain control setting will usually improve reception. This adjustment will reduce the undesired background noise that appears between signal pulses. In AM reception the RF gain control should be set for maximum gain (10).
5. Excessive background noise, ignition noise, and other pulse-type noise may be reduced or eliminated by adjusting the NOISE LIM-

ITER control. Clockwise rotation of this control increases the noise limiting capabilities of the circuit. Since limiting the noise also decreases signal strength and introduces some distortion, the NOISE LIMITER control should be advanced only to the point that adequate noise limiting is accomplished.

5-4. TRANSMITTER TUNE UP

The transmitter should be tuned up each time the transceiver is turned on or a different transmitting frequency is selected.

1. Calibrate the VFO's within the desired band of operation (see para 4-2).
2. Set the indicated controls as shown below:

FUNCTION (receiver) . .	AM or SSB/CW
SIDE BAND	UPPER
OPERATION	XMIT
FUNCTION (transmitter).	AM
GAIN (transmitter)	0
VFO SELECTOR	Desired VFO combination
BAND SELECTOR	Desired band
FINAL TUNE	To the segment corresponding to the selected band
SIDETONE	Maximum counterclockwise
QT	Maximum counterclockwise
VOX DELAY	Maximum counterclockwise
VOX LEVEL	Maximum counterclockwise
AUDIO GAIN	0
RF GAIN	0

3. Tune the VFO control of the VFO to be used in transmitting to the desired transmitting frequency.
4. Rock the FINAL TUNE control to obtain maximum deflection on the panel meter.

5-5. TRANSMITTING, MANUAL

Manual transmission may be commenced after

the VFO's have been calibrated (see para. 4-2) and the transmitter tuned up (see para. 4-4). Assuming that the controls are still set to their respective positions for tune up, rotate the FUNCTION (transmitter) control to the desired mode of operation: AM, SSB or CW.

In the AM mode of transmission all the controls remain as set for the tune up procedure except the GAIN control. Connect the microphone (if it is not already connected) to the microphone jack on the front panel. Talk into the microphone with a normal voice level while watching the panel meter and rotate the GAIN control clockwise until the meter deflects slightly above the carrier level. This is the proper setting for the GAIN control.

NOTE: IN AM TRANSMISSION, UPPER SIDEBAND MUST BE USED TO INSURE PROPER CARRIER LEVEL.

For the SSB mode of transmitting, assume all controls are set as at the completion of the tune up procedure. Rotate the transmitter FUNCTION control to SSB and select the desired sideband with the SIDE BAND control. Advance the GAIN control clockwise until the meter reads between half-scale and full-scale deflection.

For the CW mode of transmitting, all controls are to be set as at the completion of the tune up procedure. Rotate the transmitter FUNCTION control to CW; with the SIDE BAND control, select the sideband to be used. Connect the CW key through the power socket on the chassis rear (if it has not already been connected). Close the key and advance the GAIN control clockwise until maximum deflection is indicated on the meter. Do not advance the control beyond this point.

In each of the three modes of manual transmission, the transmitter is controlled by the OPERATION control. During actual transmission, the control is set to XMIT. At other times, the control is set to STBY, thus keeping the transmitter ready for instant use.

A second method of controlling the transmitter, in either the AM or SSB mode of operation, is provided when a microphone with a push-to-talk switch is used. After the transmitter has been tuned up and the GAIN control properly set, rotate the OPERATION control to the PT position. The transmitter is turned on by depressing the push-to-talk switch; when the switch is released, the transmitter is turned off.

5-6. TRANSMITTING, VOX

For VOX (voice controlled operation), the transmitter must first be adjusted for manual operation as described in paragraph 4-5. VOX can be used for AM or SSB transmitting. With the transmitter set for manual transmitting, proceed as follows:

1. Rotate the OPERATION control to the VOX position.
2. While talking into the microphone with normal voice level advance the VOX LEVEL control clockwise until the transmitter turns on.

3. Rotate the VOX DELAY control clockwise until the desired delay time (elapsed time between end of transmission and transmitter cutoff) is reached.
4. Tune in an average signal to a comfortable listening level (see para. 4-3); do not turn the transmitter off.
5. Advance the QT control clockwise until the audio level of signal being received will not turn the transmitter on through the microphone. Slight readjustment of the VOX LEVEL control may be necessary.

NOTE: Never use more VOX LEVEL or QT gain than is required for smooth voice control.

5-7. TRANSMITTING, BREAK-IN CW KEYING

Break-in CW keying is provided in VOX opera-

tion. Adjust the transmitter as described in paragraph 4-5 for manual CW operation, then proceed with the following steps:

1. Rotate the OPERATION control to the VOX position.
2. Close the CW key and advance the VOX LEVEL control clockwise until the transmitter turns on.
3. The drop out delay time is preset for CW operation, and therefore is not variable with the VOX DELAY control.
4. While operating the CW key, advance the SIDETONE control clockwise to the point where the transmitted signal can be heard in the receiver. This adjustment provides a means of monitoring the transmitted signal and may be used as desired.

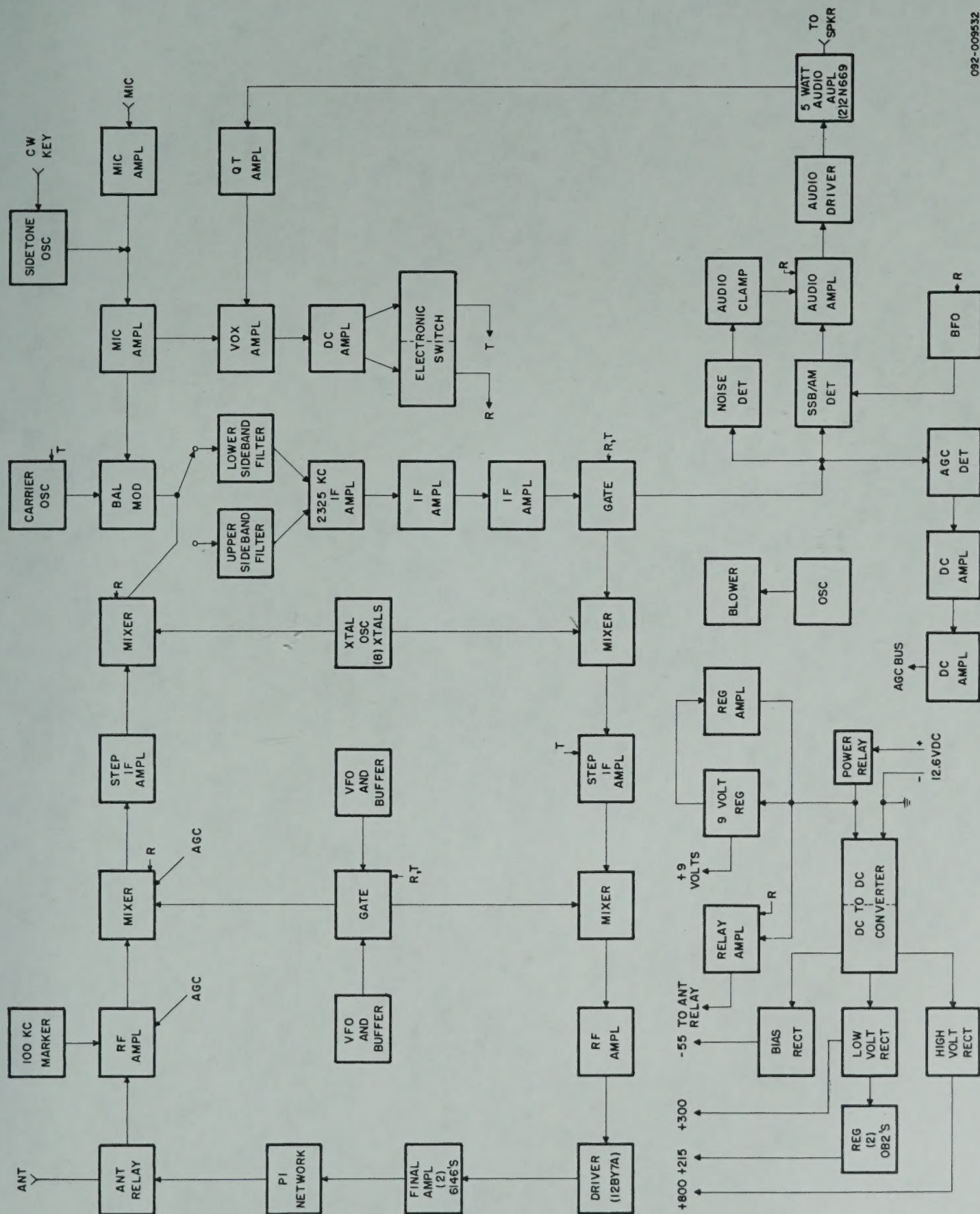


Figure 5. FPM-200 Block Diagram

